Total No. of printed pages = 4

ECE 181802

9/6/23

Roll No. of candidate | | | | | | | | | | |

2023

B.Tech. 8th Semester End-Term Examination

MOBILE COMMUNICATION

New Regulation (w.e.f. 2017-2018) & New syllabus (w.e.f. 2018-2019)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *Four* from the rest.

Answer the following : (MCQ/Fill in the blanks) (10 × 1 = 10)

1. (i) In a cellular telephone system, which type of interference results from imperfect design of filters in receivers by allowing nearby frequencies to enter the receiver?
   (a) Co-channel Interference
   (b) Adjacent-channel Interference
   (c) Both (a) and (b)
   (d) None of the above

   (ii) Which effect is widespread in adjacent-channel interference especially after the reception of a weak signal by a mobile user from the base-station?
   (a) Near-far effect
   (b) Doppler's effect
   (c) Capture effect
   (d) Kendall effect

   (iii) Which method of cellular network assists in minimizing the co-channel interference associated with the angle of degree?
   (a) Cell Splitting
   (b) Cell Sectoring
   (c) Cell Segmentation and Dualization
   (d) None of the above

[Turn over

(iv) In urban areas, fading occurs due to height of mobile antenna _____ than height of surrounding structure.

(a) Same (b) smaller

(c) Greater (d) Very larger

(v) Apparent shift in frequency in multipath wave is caused due to relative motion between _____

(a) Base station and MSC

(b) Mobile and surrounding objects

(c) Mobile and MSC

(d) Mobile and base station

(vi) Which of the following factor does not influence small scale fading?

(a) Multipath propagation

(b) Power density of base station

(c) Speed of mobile

(d) Speed of surrounding objects

(vii) Which of the following is a CDMA standard of second generation network?

(a) ETACS (b) EDGE

(c) IS-95 (d) IS-136

(viii) Which of the following is associated with the handoff in first generation analog cellular systems?

(a) Breathing cell (b) Locator receiver

(c) MAHO (d) Cell dragging

(ix) Which of the following explains the concept of diffraction loss?

(a) Archimedes' Principle (b) Fresnel zone

(c) Principle of Simultaneity (d) Pascal's Principle

(x) Which of the following is not a multipath channel parameter that can be determined from powr delay profile?

(a) RMS delay spread (b) Doppler spread

(c) Mean excess delay (d) Excess delay spread

(a) Derive the expression of signal to interference ratio for both centre excited cell and edge excited cell.

(b) Prove that for hexagonal geometry, the co-channel reuse ratio is given by $Q=\sqrt{3}\,N$.

(c) Show that the free space power received by a receiver antenna which is separated from a radiating transmitter antenna by a distance d is given by $p_r = P_t + G_t + G_r$ - (32.44 + 20logd + 20 logf) where P = Power, G = Gain, F = Frequency. (7 + 3 + 5 = 15)

(a) Differentiate between the following terms:

(i) Large-scale fading and small-scale fading.

(ii) Fast fading and slow fading

(iii) Frequency-selective fading and flat fading

(b) Define:

(i) Coherence bandwidth

(ii) Doppler spread

(iii) Coherence time

(c) The coverage area of a cellular system is 2000 sq km with each having a area of 5 sq km, and there are a total of 1000 radio channels available for handling the traffic.

(i) Calculate the system capacity for 7-cell reuse.

(ii) If N=4, how many times the cluster has to be replicated in order to approximately cover the entire cellular area? Calculate the system capacity for the given case.

(iii) Does decreasing the cluster size increases the system capacity? Explain. (9 + 3 + 3 = 15)

4. (a) Explain the two ray ground reflection model. Derive the expression for the phase difference and time delay between the direct path and ground reflection path.

(b) Define level crossing rate and average fade duration using their expression.

(c)

Delay in microseconds	Power delay (dB)
0.0	1.0
0.5	3.0
0.6	4.0
1.5	6.0

Sketch the power delay profile of the following wideband channel. Calculate the excess delay spread, mean delay and rms delay spread and coherence bandwidth of the following multipath channel. (6 + 4 + 5 = 15)

5. (a) Define spread opectrum.

(b) Differentiate between

(i) FDMA and TDMA.

(ii) CDMA and SDMA

(c) Why do we use monopole antennas while having dipole antennas? (2 + 8 + 5 = 15)

6. (a) Define Diversity. Explain briefly different types of diversity.

(b) Define Equalization technique.

(c) Explain RAKE receiver circuit with its merits and demerits. (7 + 2 + 6 = 15)

7. Write short notes on : (any three) (3 × 5 = 15)

(a) IS-95.

(b) CDMA 2000.

(c) BS antennas and arrays.

(d) BPSK

(e) MIMO system
